

Copper

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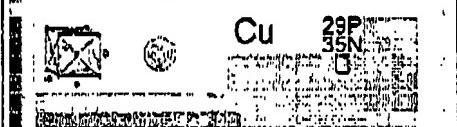
Copper (IPA: /'kɔpə/, /'kɔpər/) is a chemical element in the periodic table that has the symbol Cu (Latin: *cuprum*) and atomic number 29. It is a ductile metal with excellent electrical conductivity, and finds extensive use as an electrical conductor, heat conductor, as a building material, and as a component of various alloys.

Copper is an essential nutrient to all high plants and animals. In animals, including humans, it is found primarily in the bloodstream, as a co-factor in various enzymes, and in copper-based pigments. In sufficient amounts, copper can be poisonous and even fatal to organisms.

Copper has played a significant part in the history of mankind, which has used the easily accessible uncompounded metal for nearly 10,000 years. Civilizations in places like Iraq, China, Egypt, Greece and the Sumerian cities all have early evidence of using copper. During the Roman Empire, copper was principally mined on Cyprus, hence the origin of the name of the metal as Cyprium, "metal of Cyprus", later shortened to Cuprum. A number of countries, such as Chile and the United States, still have sizeable reserves of the metal which are extracted through large open pit mines. Nevertheless, the price of copper rose rapidly, increasing 500% from a 60-year low in 1999, largely due to increased demand. This metal has come into the limelight on account of high volatility in prices. According to *New Scientist* (May 26, 2007) the earth has an estimated 61 years supply of copper left.

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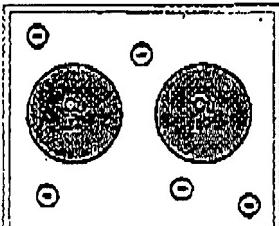
29	nickel ← copper → zinc								
↑ Cu ↓ Ag		Cu	29P 35N	Periodic table - Extended periodic table					
General									
Name, symbol, number		copper, Cu, 29							
Chemical series		transition metals							
Group, period, block		11, 4, d							
Appearance		metallic pinkish red 							
Standard atomic weight		$63.546(3)$ g·mol $^{-1}$							
Electron configuration		$[\text{Ar}] 3\text{d}^{10} 4\text{s}^1$							
Electrons per shell		2, 8, 18, 1							
Physical properties									
Phase		solid							
Density (near r.t.)		8.96 g·cm $^{-3}$							
Liquid density at m.p.		8.02 g·cm $^{-3}$							
Melting point		1357.77 K (1084.62 °C, 1984.32 °F)							
Boiling point		2835 K (2562 °C, 4643 °F)							
Heat of fusion		13.26 kJ·mol $^{-1}$							
Heat of vaporization		300.4 kJ·mol $^{-1}$							
Heat capacity		$(25$ °C) 24.440 J·mol $^{-1}\cdot$ K $^{-1}$							
Vapor pressure									
<i>P/Pa</i>	1	10	100	1 k	10 k	100 k			
at <i>T/K</i>	1509	1661	1850	2089	2404	2836			
Atomic properties									
Crystal structure		face centered cubic							
Oxidation states		2, 1 (mildly basic oxide)							
Electronegativity		1.90 (Pauling scale)							
Ionization energies									

- 5 Biological role
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Notable characteristics



Copper just above its melting point keeps its pink luster color when enough light overshines the orange incandescence color.



Copper exists as a metallically bonded substance, allowing it to have a wide variety of metallic properties.

(more)

1st: 745.5 kJ·mol ⁻¹	
2nd: 1957.9 kJ·mol ⁻¹	
3rd: 3666 kJ·mol ⁻¹	
Atomic radius	135 pm
Atomic radius (calc.)	145 pm
Covalent radius	138 pm
Van der Waals radius	140 pm
Magnetic ordering	diamagnetic
Electrical resistivity	(20 °C) 16.78 nΩ·m
Thermal conductivity	(300 K) 401 W·m ⁻¹ ·K ⁻¹
Thermal expansion	(25 °C) 16.5 μm·m ⁻¹ ·K ⁻¹
Speed of sound (thin rod)	(r.t.) (annealed) 3810 m·s ⁻¹
Young's modulus	110 - 128 GPa
Shear modulus	48 GPa

Selected isotopes

Main article: Isotopes of copper

iso	NA	half-life	DM	DE (MeV)	DP
⁶³ Cu	69.15%	Cu is stable with 34 neutrons			
⁶⁵ Cu	30.85%	Cu is stable with 36 neutrons			

References

Copper is a reddish-colored metal, with a high electrical and thermal conductivity (silver is the only pure metal to have a higher electrical conductivity at room temperature). [1] In oxidation copper is mildly basic. Copper has its characteristic color because it reflects red and orange light and absorbs other frequencies in the visible spectrum, due to its band structure. This can be contrasted with the optical properties of silver, gold and aluminium.

Copper occupies the same family of the periodic table as silver and gold, since they each have one s-orbital electron on top of a filled electron shell. This similarity in electron structure makes them similar in many characteristics. All have very high thermal and electrical conductivity, and all are malleable metals.

In its liquified state, a pure copper surface without ambient light appears somewhat greenish, another characteristic shared with gold. Silver does not have this property, so it is not a complementary color for the orange incandescence color. When liquid copper is in bright ambient light, it retains some of its pinkish luster. Due to its high surface tension, the liquid metal does not wet surfaces but instead forms spherical droplets when poured on a surface.

Copper is insoluble in water (H_2O).

There are two stable isotopes, ⁶³Cu and ⁶⁵Cu, along with a couple dozen radioisotopes. The vast majority of radioisotopes have half lives on the order of minutes or less; the longest lived, ⁶⁷Cu, has a half life of 61.8 hours. See also isotopes of copper.

Numerous copper alloys exist, many with important historical and contemporary uses. Speculum